Chapter 5: Response Rates
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As with any survey, not all individuals drawn into the sample participated. Survey response rates provide a measure of this undercoverage. This chapter provides reasons for nonresponse, response rate calculations, and tables showing overall response rates for CSFII/DHKS 1994–96.

ARS reports overall response rates when referring to final survey results. An overall response rate estimates the proportion of all eligible individuals or households that responded to a particular interview. "All eligible individuals or households" is the sum of those who actually responded to an interview (participants) and an estimate of those who were eligible to participate but did not do so (eligible nonparticipants). In general, ARS assumes that nonparticipants in various phases of the survey were eligible in the same proportions as participants.

Overall response rates can often be stated as the product of participation rates. Participation rates reflect a rate of participation relative to a particular interview. For example, the household interview participation rate is the proportion of screened households containing sample persons (SP's) who provided a household interview. This is not an estimate. The number of screened households and the number of participating households are known. An overall household response rate needs to account for all households in the sample that contain SP's. This requires estimating the number of interview-eligible households that were not screened.

The first, and often the only, interview asked of a household is the screening interview. The screening interview determines whether there are household members who are eligible for the intake interviews. Household members who are eligible are called sample persons (SP's). If there are no SP's in a household, the household's participation concludes with the screening interview. If one or more SP's are identified in the household, the household questionnaire is administered during the household interview and the day-1 food intake questionnaires are administered to each SP during the day-1 interviews. At a later time, day-2 interviews are conducted with each SP who participated in a day-1 interview. The DHKS questionnaire is administered to selected adult day-1 participants (no more than one per household) during the DHKS interview.

There were several reasons for nonresponse (nonparticipation). Refusals accounted for more than 50 percent of nonresponse for each type of interview. Inability to contact the household or SP was the next largest category of

nonresponse. Other reasons for nonresponse include the unavailability of members of a household for the field period, household members who moved and could not be located, language problems for which a suitable translator could not be found, and households in buildings or communities where access was limited.

The overall response rate formulas are provided below, along with derivations and assumptions made about the eligibility of nonparticipants. Table 11 provides a summary of the response results for the CSFII/DHKS 1994–96.

Screening

The screening rate, R_S, is defined as the proportion of nonvacant households in the sample that were screened. That is,

$$R_S = \frac{H_S}{H_S + H_{NS}}, \qquad [1]$$

where

H_S is the number of screened households and
H_{NS} is the number of unscreened households.

The number of addresses either vacant or ineligible for screening, H_v, is not relevant to this calculation. It is assumed that all such addresses were identified, that is, that all of the households represented by H_{NS} were eligible to be screened. Because screening is the first step of the interview process, the calculation of the screening rate is a simpler calculation than that of the other overall response rates. The screening rate is a factor in the computation of each of the other overall rates.

Day 1

The overall day-1 response rate, R_{D1}, may be written as the product of the screening rate, R_S, and the day-1 participation rate, R_{PART1}.

$$R_{D1} = R_S * R_{PART1}. \qquad [2]$$

The day-1 participation rate, R_{PART1}, is defined as the proportion of screened SP's eligible for day 1 who provided complete day-1 intake interviews, that is,

$$R_{PART1} = \frac{N_{D1}}{N_{SP\text{-}S(1)}},$$

where

N_{D1} is the number of SP's participating in day 1, and
$N_{SP\text{-}S(1)}$ is the number of screened SP's eligible for day 1.

An overall day-1 response rate estimates the proportion of all eligible SP's who responded to the day-1 interview. Equation 2 was derived from this definition as follows: The total number of SP's eligible for day 1, N_{SP1}, is

$$N_{SP1} = N_{SP\text{-}S(1)} + N_{SP\text{-}NS(1)} = H_S * \frac{N_{SP\text{-}S(1)}}{H_S} + H_{NS} * \frac{N_{SP\text{-}NS(1)}}{H_{NS}},$$

where

$N_{SP\text{-}S(1)}$ is the number of screened SP's eligible for day 1 and
$N_{SP\text{-}NS(1)}$ is the number of day-1-eligible SP's in the unscreened households.

It is assumed that the proportion of day-1-eligible SP's is the same among the unscreened households as it is among the screened households—

$$\frac{N_{SP\text{-}S(1)}}{H_S} = \frac{N_{SP\text{-}NS(1)}}{H_{NS}}.$$

N_{SP1} may then be estimated by N^*_{SP1}, where

$$N^*_{SP1} = H_S * \frac{N_{SP\text{-}S(1)}}{H_S} + H_{NS} * \frac{N_{SP\text{-}S(1)}}{H_S}$$

$$= (H_S + H_{NS}) * \frac{N_{SP\text{-}S(1)}}{H_S} = \frac{H_S + H_{NS}}{H_S} * N_{SP\text{-}S(1)} = N_{SP\text{-}S(1)} + \frac{H_{NS}}{H_S} * N_{SP\text{-}S(1)}.$$

Therefore, the overall day-1 response rate, R_{D1}, the ratio of day-1-participating SP's to the estimated total number of day-1-eligible SP's, is $R_{D1} = \frac{N_{D1}}{N^{*}_{SP1}} = \frac{N_{D1}}{N_{SP-S(1)} + \frac{H_{NS}}{H_S} * N_{SP-S(1)}}$.

Equivalently,

$$R_{D1} = \frac{N_{D1}}{N^{*}_{SP1}} = \frac{N_{D1}}{\frac{H_S + H_{NS}}{H_S} * N_{SP-S(1)}} = \frac{H_S}{H_S + H_{NS}} * \frac{N_{D1}}{N_{SP-S(1)}} = R_S * R_{PART1}$$

which shows R_{D1} expressed as the product of the screening rate and the day-1 participation rate, as stated by equation 2.

2 Days

The overall 2-day response rate, R_{D2}, may be written as the product of the screening rate, R_S, and the 2-day participation rate, R_{PART2}.

$$R_{D2} = R_S * R_{PART2} \qquad [3]$$

The 2-day participation rate, R_{PART2}, is defined as the proportion of screened SP's eligible for day 2 who provided complete day-2 intake interviews.

$$R_{PART2} = \frac{N_{D2}}{N_{SP-S(2)}},$$

where

N_{D2} is the number of SP's participating in day 2 and
$N_{SP-S(2)}$ is the number of screened SP's eligible for day 2.

Note that a discussion of participation in day 2 is synonymous with a discussion of 2-day participation. If an SP participated in day 2, the SP must also have participated in day 1. Similarly, an SP eligible for day 2 must have been eligible for day 1.

An overall 2-day response rate estimates the proportion of all eligible SP's who responded to the day-2 interview. The derivation of equation 3 from this definition is analogous to the derivation of the overall day-1 response rate in equation 2.

Household Interview

The overall household interview response rate, R_H, may be written as the product of the screening rate, R_S, and the household interview participation rate, R_{PARTH}

$$R_H = R_S * R_{PARTH}. \quad [4]$$

The household interview participation rate, R_{PARTH}, is defined as the proportion of screened households from which a complete household interview was obtained.

$$R_{PARTH} = \frac{N_H}{N_{H-S}},$$

where

N_H is the number of households with complete interviews and
N_{H-S} is the number of households found through screening and eligible for a household interview.

An overall household interview response rate estimates the proportion of all eligible households providing complete household interviews. The derivation of equation 4 from this definition is analogous to the derivation of the overall day-1 response rate in equation 2.

Diet and Health Knowledge Survey

The calculation of the overall DHKS response rate is more complicated than the calculation of the other overall rates because it must incorporate a modified (household level) day-1 participation rate for adults. Nevertheless, the definition can be stated simply as the product of the screening rate and two participation rates,

$$R_{DHKS} = R_S * R_{20} * R_{PARTDHK} \quad [5]$$

where

$R_{PARTDHK}$ is the DHKS participation rate and
R_{20} may be called the adult participation rate.

The DHKS participation rate, $R_{PARTDHK}$, is defined as the proportion of screened households from which a DHKS interview was attempted that actually provided complete DHKS interviews, that is, households with an SP age 20 or older who completed day 1 in person (not by proxy) and a DHKS interview. This may be written as

$$R_{PARTDHK} = \frac{N_{PARTDHK}}{N_{DHKELIG-A}}$$

where

$N_{PARTDHK}$ is the number of households with complete DHKS interviews and
$N_{DHKELIG-A}$ is the number of households from which a DHKS interview was attempted.

Because the overall rate must account for screened households with adult SP's who did not complete day 1, a second participation rate needs to be defined. This adult participation rate, R_{20}, is the proportion of screened households with one or more SP's age 20 or older that had at least one of these adult SP's complete day 1 (either in person or through a proxy).

$$R_{20} = \frac{N_{20-A}}{N_{20-A} + N_{20-NI}}$$

where

N_{20-A} is the number of screened households containing at least one adult SP and from which at least one of these adult SP's completed day 1 and
N_{20-NI} is the number of screened households containing at least one adult SP and from which none of the adult SP's completed day 1.

An overall DHKS response rate estimates the proportion of all DHKS-eligible SP's who responded to the DHKS interview. Equation 5 was derived from this definition as follows: The total number of households with DHKS-eligible respondents, $N_{DHKELIG}$, may be written as

$$N_{DHKELIG} = N_{DHKELIG-A} + N_{DHKELIG-NI} + N_{DHKELIG-NS}$$

where

$N_{DHKELIG-A}$ is the number of households for which at least one DHKS respondent was identified and a DHKS interview was attempted, that is, at least one adult SP completed a day-1 intake in person (not by proxy);
$N_{DHKELIG-NI}$ is the number of screened households with at least one DHKS-eligible SP, but where no day-1 intakes were completed by an age-eligible SP; and
$N_{DHKELIG-NS}$ is the number of unscreened households with at least one DHKS-eligible SP.

Of these three components, $N_{DHKELIG-A}$ is known and $N_{DHKELIG-NI}$ and $N_{DHKELIG-NS}$ must be estimated.

To estimate $N_{DHKELIG-NI}$, first let N_{20-NI} be the number of households with at least one age-eligible SP, but with no complete day-1 intakes for any of these SP's. Also, let N_{20-A} be the number of households with at least one age-eligible SP and at least one complete day-1 intake among these adult SP's. It is assumed that, had the screened, nonparticipating adults completed day-1 interviews, they would have done so in-person in the same proportion that was actually observed among the households with participating adults; that is,

$$\frac{N_{20\text{-}A}}{N_{DHKELIG\text{-}A}} = \frac{N_{20\text{-}NI}}{N_{DHKELIG\text{-}NI}}$$

$N_{DHKELIG\text{-}NI}$ is then estimated by $N^*_{DHKELIG\text{-}NI}$ where

$$N^*_{DHKELIG\text{-}NI} = \frac{N_{20\text{-}NI}}{N_{20\text{-}A}} * N_{DHKELIG\text{-}A}.$$

It is also assumed that DHKS-eligible households would have been found among the unscreened households in the same proportion as was actually observed among the screened households; that is,

$$\frac{N_{DHKELIG\text{-}A} + N_{DHKELIG\text{-}NI}}{H_S} = \frac{N_{DHKELIG\text{-}NS}}{H_{NS}}.$$

$N_{DHKELIG\text{-}NI}$ is then estimated by $N^*_{DHKELIG\text{-}NS}$ where

$$N^*_{DHKELIG\text{-}NS} = \frac{H_{NS}}{H_S} * (N_{DHKELIG\text{-}A} + N^*_{DHKELIG\text{-}NI}).$$

$N_{DHKELIG}$, the total number of households eligible for the DHKS is then estimated by $N^*_{DHKELIG}$ where

$$N^*_{DHKELIG} = N_{DHKELIG\text{-}A} + N^*_{DHKELIG\text{-}NI} + N^*_{DHKELIG\text{-}NS}$$

$$= N_{DHKELIG\text{-}A} + \left(\frac{N_{20\text{-}NI}}{N_{20\text{-}A}} * N_{DHKELIG\text{-}A}\right) + \left[\frac{H_{NS}}{H_S} * (N_{DHKELIG\text{-}A} + N^*_{DHKELIG\text{-}NI})\right]$$

$$= N_{DHKELIG\text{-}A} + \left(\frac{N_{20\text{-}NI}}{N_{20\text{-}A}} * N_{DHKELIG\text{-}A}\right) + \left[\frac{H_{NS}}{H_S} * \frac{(N_{20\text{-}A} + N_{20\text{-}NI})}{N_{20\text{-}A}} * N_{DHKELIG\text{-}A}\right]$$

The overall DHKS response rate, R_{DHKS}, is

$$R_{DHKS} = \frac{N_{PARTDHK}}{N^{*}_{DHKELIG}}$$

$$= \frac{N_{PARTDHK}}{N_{DHKELIG-A} + \left(\frac{N_{20-NI}}{N_{20-A}} * N_{DHKELIG-A}\right) + \left[\frac{H_{NS}}{H_S} * \frac{(N_{20-A} + N_{20-NI})}{N_{20-A}} * N_{DHKELIG-A}\right]}$$

where

$N_{PARTDHK}$ is the number of complete DHKS interviews.

R_{DHKS} may also be written as

$$R_{DHKS} = \frac{N_{PARTDHK}}{N_{DHKELIG-A} + N^{*}_{DHKELIG-NI} + \left[\frac{H_{NS}}{H_S} * (N_{DHKELIG-A} + N^{*}_{DHKELIG-NI})\right]}$$

$$= \frac{N_{PARTDHK}}{\left(1 + \frac{H_{NS}}{H_S}\right) * (N_{DHKELIG-A} + N^{*}_{DHKELIG-NI})}$$

$$= \frac{N_{PARTDHK}}{\left(1 + \frac{H_{NS}}{H_S}\right) * \left[N_{DHKELIG-A} + \left(\frac{N_{20-NI}}{N_{20-A}} * N_{DHKELIG-A}\right)\right]}$$

$$= \frac{N_{PARTDHK}}{\left(1 + \frac{H_{NS}}{H_S}\right) * \left(1 + \frac{N_{20-NI}}{N_{20-A}}\right) * N_{DHKELIG-A}}$$

$$= \frac{H_S}{(H_S + H_{NS})} * \frac{N_{20-A}}{(N_{20-A} + N_{20-NI})} * \frac{N_{PARTDHK}}{N_{DHKELIG-A}}.$$

Therefore, R_{DHKS} may be expressed as the product of the screening rate and two participation rates,

$$R_{DHKS} = R_S * R_{20} * R_{PARTDHK}, \quad [5]$$

where

R_S is the screening rate,

$R_{PARTDHK} = \frac{N_{PARTDHK}}{N_{DHKELIG-A}}$, is the DHKS participation rate, and

$R_{20} = \frac{N_{20-A}}{N_{20-A} + N_{20-NI}}$ is the adult participation rate.

This participation rate, R_{20}, is the proportion of screened households with one or more SP's age 20 or older that had at least one of these adult SP's complete day 1 (either in person or through a proxy).

Table 11.—CSFII/DHKS Response Rates for 1994–96

Category	1994–96	1994	1995	1996
Total dwelling units selected	34,016	9,628	11,823	12,565
Dwelling units vacant or determined not to be households	4,189	1,161	1,337	1,691
Occupied dwelling units ($H_S + H_{NS}$)	29,827	8,467	10,486	10,874
Screened households (H_S)	29,371	8,333	10,333	10,705
Screening rate (R_S)	**98.5%**	**98.4%**	**98.5%**	**98.4%**
Total SP's identified through screening [1]	19,830	6,868	6,576	6,386
Screened SP's eligible for day 1 ($N_{SP\text{-}S(1)}$)	19,818	6,864	6,570	6,384
SP's completing day 1 (N_{D1})	16,103	5,589	5,326	5,188
Day-1 participation rate (R_{PART1})	81.3%	81.4%	81.1%	81.3%
Overall day-1 response rate (R_{D1})	**80.0%**	**80.1%**	**79.9%**	**80.0%**
Screened SP's eligible for day 2 ($N_{SP\text{-}S(2)}$)	19,813	6,863	6,567	6,383
SP's completing day 2 (N_{D2})	15,303	5,311	5,072	4,920
Two-day participation rate (R_{PART2})	77.2%	77.4%	77.2%	77.1%
Overall 2-day response rate (R_{D2})	**76.1%**	**76.2%**	**76.1%**	**75.9%**
Screened households eligible for household interview ($N_{H\text{-}S}$)	9,658	3,264	3,376	3,018
Households completing household interview (N_H)	8,302	2,813	2,892	2,597
Household interview participation rate (R_{PARTH})	86.0%	86.2%	85.7%	86.1%
Overall household interview response rate (R_H)	**84.6%**	**84.8%**	**84.4%**	**84.7%**
Households with adult SP's completing day 1 and eligible for DHKS ($N_{DHKELIG\text{-}A}$)	6,294	2,047	2,159	2,088
DHKS participants ($N_{PARTDHK}$)	5,765	1,879	1,966	1,920,
DHKS participation rate ($R_{PARTDHK}$)	**91.6%**	**91.8%**	**91.1%**	**92.0%**
Screened households with at least one adult SP ($N_{20\text{-}A} + N_{20\text{-}NI}$)	7,803	2,527	2,700	2,576
Screened households with at least one adult SP who completed day 1 ($N_{20\text{-}A}$)	6,360	2,073	2,188	2,099
Adult participation rate (R_{20})	81.5%	82.0%	81.0%	81.5%
Overall DHKS response rate (R_{DHKS})	**73.5%**	**74.1%**	**72.7%**	**73.8%**

[1] In several cases, SP's were identified through screening but left the population of interest before they had a chance to participate. This happened when SP's moved out of the United States, were institutionalized, or died.